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AUTHOR Jacobs, Victoria R.; Goldberg, Merryl R.; Bennett, Tom R.
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ABSTRACT

Arts in elementary schools have often been separated from the core curriculum and offered as enrichment activities that are considered beneficial but not essential. This paper highlights how teaching science through the arts can help students more deeply understand core scientific concepts. Specific examples in the paper depict lessons of different lengths in a variety of science topics, art techniques, and grade levels (1-5). The paper's examples show different uses of teaching through the arts; for example, arts can help introduce a topic to students and/or help them review information they have already been studying. Finally, the paper states that this set of examples was chosen to illustrate some additional benefits of teaching through the arts such as engaging and motivating students, reaching "all" students (including some who are traditionally unsuccessful), and introducing students to the arts themselves. (BT)

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# Teaching Core Curriculum Content Through the Arts

**Victoria R. Jacobs**
**San Diego State University**

**Merryl R. Goldberg** **Tom R. Bennett**
**California State University San Marcos**

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*The second-grade classroom is darkened, like a cave. The children sit on the floor anxiously awaiting who will be chosen to play the baby bats and who will become the mother bats. Six children are identified as baby bats. Each baby learns to make a clicking sound with his/her tongue and is given an odor (i.e., a cup containing paint, soap, banana, apple, vinegar, or chocolate cupcake). Six mother bats are blindfolded and then each is paired with a baby to learn her baby's specific clicking sound and odor. It is time for the drama to begin. The mother bats go out of the cave to find food. During this time, the baby bats rearrange themselves and line up to represent a small group of the many baby bats that hang upside-down in a cave waiting for their mothers to bring back food. One-by-one the mother bats return to the cave and try to find their babies only using sound and odors as clues.*

After this drama, this teacher commented that she felt her students finally understood what it means to be a night creature (vs. a day creature) and how a bat moves through the darkness using only sound and smell to find its baby. In the past, this teacher felt that she had talked about these concepts, but the students had never *experienced* them, and therefore, never really understood them. Six months after this drama activity, students still talked about finding their babies and could even recall the specific odors they had used to represent those babies.

*The fourth grade class is preparing to produce a play about nature in which the students will portray animals like tigers, coyotes, and rabbits. On this day, students are working in groups to create short scenes with animals and some type of action. Some of the students will play animals and others will serve as musicians playing an instrument. The animals will use actions but no words. The musicians will dictate the pace of the scene and changes in the action with changes in their music. Students begin performing for each other. The teacher reminds the students: "Anyone can put on a costume and look like a cat but you need to act like a cat. Your personality needs to take on the animal's personality." However, this session is the first time the children have tried to "become" animals. Many of the scenes are short with children giggling, and the action is usually restricted to chasing each other.*

This lesson is the beginning of several lessons designed to use drama to help the students improve both their observation skills and their understandings about animal characteristics. Rather than provide students with elaborate costumes and props, the teacher wanted students to "become" their animals. In a subsequent lesson, she had students study animal characteristics by viewing videos about animals and their habitats. Students were also assigned homework that required close observations of the mannerisms of a pet or other animal. In another lesson, students learned a Brazilian dance, *capoeira*, to help them move

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more like animals and less like children. The teacher also created a "magic carpet" activity to help students move beyond their silliness and become their animals. The magic carpet was a rectangle of floor space marked off by yarn. When students stepped into the magic carpet, they became an animal with all of its characteristics, actions, etc. When students stepped out of the magic carpet, they were children again. This delineation helped students focus on portraying their animal with appropriate characteristics, movements, and intentions. Over time and through participation in these types of activities, students' understandings and performances improved.

The arts have long been known to deeply connect people with ideas and emotions (Dewey, 1959; Greene, 1991). However, arts in elementary schools have often been separated from the core curriculum and instead, offered as enrichment activities that are considered beneficial but not essential. The two dramas described above provide examples of how the arts can be integrated with other subjects in order to teach core curriculum such as science. This use is in contrast to the more traditional form of arts education in which the goal of using the arts is to teach the arts themselves. Goldberg (1997) highlights this distinction by contrasting teaching *about* the arts (traditional disciplined-based arts instruction) with teaching *through* the arts (using the arts as a vehicle or teaching strategy to help students understand content other than the arts). This paper will specifically highlight teaching science through the arts in elementary school.

Teaching through the arts requires students to engage in the act of *creating art*. For example, they might draw a picture, write a poem, act in a drama, or compose music to further their understandings of concepts in content areas other than the arts. Teaching through the arts helps students *experience* concepts rather than simply discussing or reading about them. This approach is consistent with educational theories that highlight the importance of reaching multiple learning styles or intelligences (Gardner, 1993). In particular, the arts have been remarkably effective in multicultural and multilingual settings. Written and verbal language barriers often seem to disappear when the arts are involved. The arts become a new language, one with which students learning English as a second language can communicate (Gallas, 1994; Goldberg, 1997).

Teaching through the arts also has the potential for providing other benefits traditionally associated with the arts. Specifically, the study of the arts has been linked to students' increased critical and creative thinking skills, self-esteem, willingness to take risks, and ability to work with others (Gallas, 1994; Goldberg, 1997). In some cases, researchers have also found a relationship between the study of arts and improved scores on standardized tests (Catterall, 1995; College Entrance Examination Board, 1996; Goldberg & Bossenmeyer, 1998).

Finally, teaching core curriculum through the arts introduces children to the arts themselves. Given the shrinking budgets of school districts around the country, arts specialists and arts programs have disappeared from many elementary schools. Teaching through the arts provides teachers with a means of using the arts successfully and in a way that it is not just "one more thing" they must include in the curriculum. Rather, as one teacher stated, teaching through the arts is

"accomplishing the same goals and the same tasks, but in a better way." At the same time, students are exposed to the arts as worthwhile disciplines in and of themselves.

The goal of this paper is to highlight how teaching science through the arts can help students more deeply understand core scientific concepts. Specific examples were selected to depict lessons of different lengths in a variety of science topics, art techniques and grade levels (1-5). The examples also show different uses of teaching through the arts. For example, arts can help introduce a topic to students and/or help them review information they have already been studying. Finally, this set of examples was chosen to illustrate some additional benefits of teaching through the arts such as engaging and motivating students, reaching *all* students (including some who are traditionally unsuccessful), and introducing students to the arts themselves.

**Grade 1: Learning about Weather Vocabulary Through Drama**

The teacher taught weather vocabulary through the arts by helping students use drama to express and interpret their understandings of vocabulary. The focus was vocabulary that the class had previously identified in their weather-related literature such as frost, rainbow, sunny and cloudy. Each word was listed in a pocket chart next to a drawing the children had already created to depict the meaning of the word. All the words were removed from their pockets, shuffled, and placed into a hat to be picked. Students were divided into pairs and each pair picked a word that they needed to discuss and then decide how to depict in a dramatic scene. To help others understand the meaning of their word, students were allowed to use actions and sounds, but no words. The rest of the class then tried to guess the word based on the students' dramatic presentation.

For example, two girls showed "shade" by having one girl sit on the ground with the other girl leaning over her with arms outstretched and fingers wiggling. The students were able to guess the word "shade" as they recognized the standing girl as a tree offering shade to a sitting girl. They also recognized the tree by her leaves (fingers) blowing in the wind. In another pair, two boys showed two depictions of the word "blow." First, one boy puckered his lips and blew as hard as he could and the second boy pretended to fall over. At this point, the other students guessed "windy." Next, the boys both blew really hard to make the American Flag in the room move back and forth. With this clue, the other students were able to guess the correct word "blow." This example shows how this activity not only helps children gain an understanding of the target word, but it also highlights related words such as "wind" and "blow." Finally, two boys showed their understanding of "warm" by using their knowledge of its antonym "cold." The boys began their skit by shivering in the cold. They then moved themselves inside by a warm fire and began drinking hot chocolate. Both the process of creating and interpreting these presentations helped deepen students' understandings. The teacher saw such growth in the students' understandings

that she continued the activity with a new set of vocabulary words in the following lesson. Students also overwhelmingly agreed that they enjoyed the activity and thought it was a good way to study their vocabulary words.

**Grade 2: Learning about the Water Cycle Through Movement and Music**

The teacher taught the water cycle through movement and music by helping the students experience the cycle over a series of lessons. First, the students were informally introduced to the water cycle as part of a series of activities to help them understand the idea of snowflakes which was the topic of their poetry lesson. In order to "experience" being a snowflake, students listened to Tchaikovsky's Nutcracker Suite (the Waltz of the Snowflakes) by closing their eyes and visualizing themselves as snowflakes on an adventure -- beginning as a water drop, turning into vapor, condensing, and then shattering and falling to the ground as a snowflake. The students were asked where they landed after their adventure and the responses included landing on a tree, in a Jacuzzi, in the mountains, and on somebody's head. The teacher also shared her adventure in which she landed on the eyelash of a deer. The students then listened to the music again, this time acting out the water cycle (the snowflake's adventure) with movement and dancing. The teacher even continued the play-acting by integrating the ideas into her classroom management. For example, she asked the students to go back to their desks as snowflakes flying, twirling, etc. Through these inviting introductory activities, students began to develop an interest in the water cycle. The motivational powers of the arts are significant as this teacher explained, "Hooking a kid is half, if not more than half, the battle of learning. If you can hook them then you can get them to learn."

In subsequent lessons, the teacher more formally introduced the water cycle by identifying and explaining the stages of accumulation, evaporation, condensation, and precipitation. The students then created a "sound sculpture" to reflect the water cycle. Students built this sound sculpture by making different sounds (e.g., pounding on the floor, snapping, hand rubbing, etc.) to represent each stage in the water cycle. Students played the four stages, in order, over and over again in order to reflect the cyclical nature of the water transformations. Some students then developed movements (e.g., twirling, freezing, etc.) to correspond with each stage. Others were given "instruments" (e.g., bottle, umbrella, wastebasket, etc.) to develop a new set of sounds. The performance was then repeated multiple times with some of the students showing movements while others were making music. The teacher eventually challenged the musicians to move beyond four sounds by asking them also to incorporate different rhythms and speeds.

The teacher kept the students focused on the scientific concepts by using proper vocabulary and through her questioning. She did not tell the students which sounds or movements to use as substantial learning occurred through this creation process. Rather, she pushed students to think

deeply about their sound and movement choices as these choices reflected their understandings of the scientific concepts. She asked general questions like "What does accumulation mean?" and "What might accumulation sound like?" She also challenged students on some of their choices. For example, students initially only rolled themselves into a ball to indicate accumulation (as in water droplets in a pond). The teacher expanded their understanding of this stage beyond water droplets that are still by challenging them to create sounds and movements that reflected water droplets rolling downstream in a river or stream. Similarly, when students were all using the same sound for rain falling, she challenged students to discover different sounds that reflected how we hear rain differently when it falls on grass, cars, people's heads, etc.

**Grade 3: Learning about the Solar System Through Music**

The teacher taught the solar system through the arts by helping students create music to review and deepen their understandings of information they had already been studying. Specifically, groups of 3-4 students worked together to develop lyrics that reflected their understandings of the earth, moon and/or sun. The new lyrics were to be sung using a familiar tune such as *Row Row Row Your Boat* or *Twinkle Twinkle Little Star*. Initially, the class jointly brainstormed all of the relevant scientific facts and concepts that they knew. After writing this information on the board, students broke into groups to decide on their topic, brainstorm possible sentences to include, and then compile the sentences to match their assigned tune. For example, one group created the following lyrics to be sung to the tune of *Row Row Row Your Boat*:

Moon Moon in the Sky

Moon Moon in the Sky
What are you made of?
I am made of dust and rock
and I have craters too.

Another group created lyrics for *Are You Sleeping*:

The Moon

*(Verse 1)*
Moon has phases.
Moon has craters.
Yes it does.
Yes it does.
It is without gravity.
It is without atmosphere.
Nothing lives.
Nothing lives.

*(Verse 2)*
Waxing waning.
Waning waxing.
Moon is new.
Moon is full.
When it's new it can't be seen.
When it's full it shines bright.
Pretty sight.
Awesome sight.

In order to create these lyrics, students needed to work in their small groups to discuss their understandings and convince others of the facts they wanted to convey. For example, one group

debated whether the moon had a small amount of gravity or no gravity at all. Another group recognized that a song about the moon should not include references to day and night since those concepts involved the moon but actually applied to the earth. Other students explored relationships between concepts by, for example, needing to find synonyms so that the concept would match the assigned tune. The teacher kept the students focused on the scientific content by asking questions such as "What is your song teaching us?" Throughout the activity, the textbook was available for students to consult as a reference and as a source for additional information. Students also reviewed concepts and clarified understandings by listening to the other students' presentations.

In addition to scientific content, the teacher helped the students gain an appreciation for lyricists and their profession. She drew from the students' recent experiences watching the Academy Awards in which music from the movie *Titanic* won best song. The teacher explained:

> Think about James Horner. He was the man who wrote the music to *Titanic*, and he also wrote the song. This is just real basic what we're doing here. We're trying to tie in some of what we know, our knowledge of the moon, into some songwriting. And taking songs that we already know and we're just plugging in facts that we know about the moon. But think about a songwriter like James Horner who wrote that music and had absolutely nothing to really go on other than his experience and his expertise. And now you really can feel the excitement that he must have had being chosen [at the Academy Awards] among all of those incredible musicians. . . . So you understand the difficulty in songwriting. Every time you listen to a song, you should really appreciate the fact that somebody probably didn't get a whole lot of sleep at some point in time!

**Grade 4: Learning about Adaptation Through Drawing**

The teacher taught the concept of adaptation through a drawing activity in which the students had to apply their knowledge of adaptation to create a new species of fish. Students were divided into groups and each group was given a different set of four adaptation cards. The cards indicated the (1) mouth (e.g., sucker-shaped, elongated upper jaw, etc.), (2) coloration (e.g., striped, light-colored belly, etc.), (3) body shape (e.g., torpedo-shaped, humpbacked, etc.), and (4) reproduction (e.g., floating eggs, live birth, etc.). For example, a group might receive cards that indicate that their fish must have a sucker-shaped mouth, striped coloration, vertical disk-like shape, and live birth for reproduction. The teacher also provided each group with an information sheet describing advantages and examples of the adaptations (in each of the four categories). For example, for the sucker-shaped mouth, the information sheet identified the advantages of this mouth type (i.e., the ability to bottom feed) and provided examples of fish with sucker-shaped mouths. Students were asked to be creative in designing their fish and its environment. The only requirements were that their fish needed to contain the four adaptations described on their cards. The students acted as scientists, even calling themselves "Doctor". After designing their fish, each group created a scientific name for the fish, making sure the name was consistent with the four adaptations.

Students reviewed concepts and deepened understandings by having to discuss what characteristics to give their fish. For example, one group discussed whether it was sensible to give a wide tail to a fish with a torpedo-shaped body. They eventually recognized that a wide tail on a torpedo-shaped body would negate one of the main advantages of a sleek body shape: speed. The teacher commented that this approach "allowed them [students] to go ahead and see relationships better . . . it really caused them to focus on those adaptations." The creative process pushed students to really understand the adaptations and their advantages. This activity was also particularly motivating as it followed a class visit to an aquarium.

### Grade 5: Learning about Animals and Their Environments Through Origami and Story Telling

The teacher reviewed animals and their environments by having the students develop and present stories of origami creatures that they invented. Initially, students were guided through the steps for how to make an origami creature, and then given the opportunity to decorate it in any way they wished. Students caught on quickly and not only made more creatures of the same size, but figured out how to make creatures of different sizes thereby creating "families" of creatures. This lesson was initially a mathematics lesson based on paper folding, but the creatures were so motivating to the students that the teacher decided to extend the lesson to science as a review of previous work on understanding animals and their environments. She explained, "You can't just create a creature and have no life form . . . every person, every living thing has a story to tell." Each student was then invited to tell a story about his/her creature. The teacher reflected on this activity:

> We didn't sit there and discuss . . . you need to include this and you need to include that. I just said it had to be from the animal kingdom and you had to be aware of their environment and somehow put that into your story. But they were real creative. . . . Some of them used personification. Some of them were very scientific and factual, and I thought, well, that's neat they can be so creative. And I had so many kids participate in that. I was just figuring that one or two people would get up there but they all wanted to get up!

The teacher was impressed both with the content of the students' presentations and with their eagerness to participate – even by those children who were shy or typically did not participate. She specifically noted that "a lot of the kids that turned out to be experts with origami were the kids who normally struggle in class academically, so that's always a nice change." Teaching through the arts is often motivating and effective in making the lesson accessible to *all* students. In doing so, teachers are often able to see their students in new ways.

**Conclusion**

In addition to introducing students to the arts themselves, these examples show the power of the arts as a teaching strategy for a variety of scientific content. The arts can help students experience, and therefore more deeply understand concepts in science and other core curriculum areas. Whether used as an introduction or a review technique, the arts have the power to motivate and engage students, even those who are traditionally unable or unwilling to participate fully in school lessons. In short, teachers and students enjoy teaching (learning) through the arts and consequently, this approach can serve as an effective, although often overlooked, teaching strategy. However, integrating the arts into an activity does not guarantee that a lesson will be successful. Teachers play an important role in highlighting scientific (or other) content so that the goals of the lesson do not get lost. One example of a program that helps teachers learn how to teach through the arts is SUAVE. SUAVE (Socios Unidos para Artes via Educación, or, United Community for Arts in Education) is a professional development program that supports K-8 teachers in developing ways to integrate the arts into the curriculum areas of language arts, mathematics, science, and social studies (Goldberg, 1997; Goldberg & Bossenmeyer, 1998). All of the examples described in this paper were drawn from SUAVE classrooms in four elementary schools in three districts in San Diego County. For more information on the SUAVE program, see *http://www.csusm.edu/SUAVE.*

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## Teaching Core Curriculum Content Through the Arts

Victoria R. Jacobs
San Diego State University

Merryl R. Goldberg  Tom R. Bennett
California State University San Marcos

American Educational Research Association Annual Meeting, April 1999, Montreal, Canada

**Discussion Issues:**

- Why is teaching through the arts so effective and enjoyable?
- How can we help teachers:
  (a) believe in the power of teaching through the arts
  (b) learn how to teach through the arts
  (c) learn to design and implement activities that promote learning of content (vs. only participation in a fun activity)
- Are there particular topics or content areas that are easier/harder to teach through the arts?

**Second Grade Example:**

The second-grade classroom is darkened, like a cave. The children sit on the floor anxiously awaiting who will be chosen to play the baby bats and who will become the mother bats. Six children are identified as baby bats. Each baby learns to make a clicking sound with his/her tongue and is given an odor (i.e., a cup containing paint, soap, banana, apple, vinegar, or chocolate cupcake). Six mother bats are blindfolded and then each is paired with a baby to learn her baby's specific clicking sound and odor. It is time for the drama to begin. The mother bats go out of the cave to find food. During this time, the baby bats rearrange themselves and line up to represent a small group of the many baby bats that hang upside-down in a cave waiting for their mothers to bring back food. One-by-one the mother bats return to the cave and try to find their babies only using sound and odors as clues.

**Third Grade Example:**

The Moon

| *(Verse 1)* | *(Verse 2)* |
|---|---|
| Moon has phases. | Waxing waning. |
| Moon has craters. | Waning waxing. |
| Yes it does. | Moon is new. |
| Yes it does. | Moon is full. |
| It is without gravity. | When it's new it can't be seen. |
| It is without atmosphere. | When it's full it shines bright. |
| Nothing lives. | Pretty sight. |
| Nothing lives. | Awesome sight. |

"Think about James Horner. He was the man who wrote the music to *Titanic*, and he also wrote the song. This is just real basic what we're doing here. We're trying to tie in some of what we know, our knowledge of the moon, into some songwriting. And taking songs that we already know and we're just plugging in facts that we know about the moon. But think about a songwriter like James Horner who wrote that music and had absolutely nothing to really go on other than his experience and his expertise. And now you really can feel the excitement that he must have had being chosen [at the Academy Awards] among all of those incredible musicians. . . . So you understand the difficulty in songwriting. Every time you listen to a song, you should really appreciate the fact that somebody probably didn't get a whole lot of sleep at some point in time!" (third grade teacher)

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